

AIR SERVICE INFORMATION CIRCULAR

(AVIATION)

PUBLISHED BY THE CHIEF OF AIR SERVICE, WASHINGTON, D. C.

Vol. IV

May 15, 1922

No. 344

REPORT ON THE PERFORMANCE OF THE WRIGHT MODEL H-2 "SUPERFIGHTER" ENGINE

(POWER PLANT SECTION REPORT)



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January 16, 1922



WASHINGTON
GOVERNMENT PRINTING OFFICE
1922

CERTIFICATE: By direction of the Secretary of War, the matter contained herein is published as administrative information and is required for the proper transaction of the public business.

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REPORT ON THE PERFORMANCE OF THE WRIGHT MODEL H-2 "SUPERFIGHTER" ENGINE.

OBJECT OF TEST.

The test was conducted to determine the power output and fuel consumption of two Model H-2 Wright "Superfighter" engines and to compare their performance with that of the standard Model H Hispano-Suiza engine and a Model H Hispano-Suiza equipped with 6½ : 1 compression ratio.

SUMMARY OF RESULTS.

	Standard Hispano-Suiza Model H.	Hispano-Suiza Model H 6½:1 compression.	Wright Model H-2(1). ²	Wright Model H-2(2). ²
Corrected brake horsepower, 1,800 revolutions per minute	326.0	352.0	373.0	359.0
Corrected brake horsepower, 2,000 revolutions per minute	358.5	378.0	404.0	388.0
Brake mean effective pressure pound per square inch 1,800 revolutions per minute	127.5	137.5	145.0	140.0
Brake mean effective pressure pound per square inch 2,000 revolutions per minute	126.5	132.5	141.5	136.5
Specific fuel consumption pound per horsepower hour 1,800 revolutions per minute	.525	.468	.455	.503
Specific fuel consumption pound per horsepower hour 2,000 revolutions per minute	.525	.477	.467	.506

¹ 5.3 : 1 compression ratio.

² Wright Model H-2 (1)—A. S. #94947, Wright Model H-2 (2)—A. S. #94895, "Superfighters."

CONCLUSIONS.

The two Wright Model H-2 engines tested showed an increase in brake horsepower over the Hispano-Suiza Model H of 9 and 14 per cent at 1,800 revolutions per minute with corresponding reductions in specific fuel consumption of 4 and 13 per cent, respectively. At 2,000 revolutions per minute the Model H-2 brake horsepower were 8 and 13 per cent greater than that of the Model H and their specific fuel consumption 4 and 11 per cent lower, respectively.

DESCRIPTION.

The Wright Model H-2 engine is a redesign of the Hispano-Suiza Model H. (A description of the Model H engine is available in Engineering Division Report, Serial No. 798). Below are summarized the principal modifications constituting the Model H-2 characteristics. (For a complete statement as to the characteristics of the various models of the Wright series, see a letter from the chief engineer of the Wright Aeronautical Corporation to the Engineering Division, dated November 3, 1921.)

The cylinder head thickness has been increased 0.093 inch.

The magneto brackets are inclined at the engine end to permit the use of continuous engine bearers.

The oil return pipe is fitted at the side rather than under the lower half of the crank case.

Lightened pistons with 6½:1 compression ratio.

Weight 610 pounds.

The high compression H-2 engine, called the Wright "Superfighter" is manufactured by the Wright Aeronautical Corporation, Paterson, N. J. Photographs of the engine are included in figures 2, 3, and 4.

METHOD OF TEST.

The engines were mounted, successively, on the dynamometer (electric cradle) and the following runs made:

Two full-power check runs at 2,000 revolutions per minute.¹

One full-power run, 1,500-2,100 revolutions per minute.

One friction horsepower run, 1,500-2,100 revolutions per minute.

The fuel used on the test consisted of a 50 per cent mixture by volume of benzol and aviation gasoline (War Department Specification No. 2-40). A description of the test apparatus and the methods of testing and computing results is available in Engineering Division Report No. 1507.

ANALYSIS.

Data from these runs are included in Tables 1 and 2. The curves in figure 1 include, for comparative purposes, the results of tests with the standard compression ratio Hispano-Suiza Model H engine, with the Hispano-Suiza Model H with 6½:1 compression ratio pistons, and with the two high compression Model H-2 engines. The tests of the Model H (standard compression ratio) and the special Model H with 6½:1 compression ratio are described in Engineering Division Reports Nos. 796 and 1710, respectively. The Model H engine with 6½:1 compression ratio pistons was converted, at McCook Field, by the Engineering Division from a standard Model H engine, by the installation of special pistons. No other changes were made. The power increase obtained over the low compression was not as great as could have been expected from tests in other types of engines with the same compression ratios and from tests on high compression Wright engines conducted at the plant of the Wright Aeronautical Corporation. For these reasons the laboratory tests were conducted on the Wright "Superfighter" engines.

The two Model H-2 engines developed, respectively, 373 and 359 horsepower at 1,800 revolutions per minute compared with the Model H horsepower of 326 at that speed. The difference was slightly less marked at 2,000 revolutions per minute, 404 and 388 horsepower for the H-2 engines against 358.5 for the Model H.

¹ With carburetor mixture control set successively for full rich, leanest mixture allowing of maximum power, and for full lean.

The corresponding specific fuel consumptions at 1,800 revolutions per minute were 0.455 and 0.503 pound per horsepower hour for the H-2 engine and 0.525 for the Model H. At 2,000 revolutions per minute the Model H-2 engines consumed 0.467 and 0.506 pound of fuel per horsepower-hour and the Model H 0.525 pound.

The brake mean effective pressure variations correspond with those in horsepower. At 1,800 revolutions per minute the Model H-2 engines developed 145 and 140 pounds per square inch brake mean effective pressure, while the Model H developed 127.5 pounds per square inch. At 2,000 revolutions per minute the Model H-2 engines developed 141.5 and 136.5 pounds per square inch, against 126.5 pounds per square inch for the Model H.

Both Wright H-2 "Superfighter" engines showed higher mean effective pressures and horsepower than did the Model H Hispano-Suiza with the high compression pistons

installed at McCook Field. In fuel consumption, however, one of the Model H-2 engines fell below and one exceeded the high compression Model H.

It should be added that the "Superfighter" and the McCook Field high compression Hispano-Suiza engines were equipped with "modified" NAD-6 carburetors. The standard Model H Hispano-Suiza engine (with 5.3 compression ratio), the performance of which was used as a basis of comparison for the other engines, was equipped with an unmodified NAD-6 carburetor. The modification consists in a special accelerating well which permits of the use of a "leaner" metering orifice without sacrificing good engine acceleration. As in all cases the fuel mixture was adjusted with the mixture control to the proper strength (for best power consistent with fuel economy), the difference in the size of the metering orifices did not affect the comparability of the test results.

TABLE 1.—Model H-2 Engine, A. S. No. 94947.

FULL POWER CHECK RUN.

R. p. m.	Actual.		Corrected.		Water.		Oil.			Carb. air temp. °F.	Man. vac. in. hg.	Mix. control position.	Fuel cons.	
	Brake load lbs.	B. h. p.	H. p.	B.m.e.p., lbs. per sq. in.	Temp. °F.		Temp. °F.		Press. lbs. per sq. in.				Lts. per hr.	Lbs. per hp. hr.
					In.	Out.	In.	Out.						
2,012	589.0	395.1	404.9	141.7	132	151	112	130	74	54	1.8	Full rich. } 189.6	0.480	
1,994	585.5	389.4	399.0	140.3	133	151	122	140	73	55	1.8			
					131	150	130	144	72	55	1.7			Best
					132	151	136	150	72	55	1.7			

Speed drops to 1400 r. p. m., brake load to 390 lbs., at full lean.

FULL POWER CHECK RUN.

2,026	588.5	397.5	407.2	141.5	132	150	102	130	70	56	1.7	Full rich.	191.4	0.482
2,002	585.5	390.7	400.3	140.3	130	148	110	138	70	56	1.7	Best		
					132	150	111	140	70	57	1.7		187.0	.453
					134	152	104	138	70	57	1.7			

Irregular operation at full lean.

¹ Leanest setting allowing maximum power output.

Brake arm, 21 inches.
Kind of oil, Spec. No. 2-23 Grade B-3, 115-125 sec.
Fuel used spec. grav., 50 per cent benzol, 50 per cent domestic aviation gasoline.
Spark plugs, A. C.

Carburetor used, Stromberg NA-D6 Mod. 1.
Chokes, 1-13/16 inches.
Main jets, flow 74.5 pts. per hr.
Average barometer, 29.20 in. hg.
Date, October 12, 1921.

FULL POWER RUN.

R. p. m.	Actual.		Corrected.		Water.		Oil.			Carb. air temp. °F.	Man. vac. in. hg.	Mix. control position.	Fuel cons.	
	Brake load lbs.	B. h. p.	H. p.	B.m.e.p. lbs. per sq. in.	Temp. °F.		Temp. °F.		Press. lbs per sq. in.				Lbs. per hr.	Lbs. per hp. hr.
					In.	Out.	In.	Out.						
1,480	598.0	294.0	301.3	143.0	126	151	98	122	70	56	0.8	3.8	129.5	0.441
1,600	600.0	320.0	328.0	144.1	130	150	98	124	70	56	1.0	3.8	145.2	.450
1,670	604.0	336.5	345.0	145.2	130	149	98	126	68	56	1.2	3.8	154.9	.460
1,790	607.0	362.3	371.4	145.8	130	150	98	126	68	56	1.4	3.8	160.0	.442
1,890	599.0	377.5	387.0	143.9	130	149	98	130	68	56	1.6	3.8	172.7	.458
2,010	588.0	394.1	403.9	141.2	132	150	100	134	68	56	1.8	3.8	183.7	.466
2,100	578.0	404.6	414.7	138.8	Flash reading.							3.8		

TABLE 1.—Model H-2 Engine, A. S. No. 94947—Continued.

FRICTION HORSEPOWER RUN.

R.p.m.	Brake load lbs.	F. h. p.	F.m.e.p. lbs. per sq. in.	Water.		Oil.		
				Temp. °F.		Temp. °F.		Press. lbs. per sq. in.
				In..	Out.	In.	Out.	
1,500	59.0	29.5	13.8	150	152	94	114	72
1,600	67.5	36.0	15.8	150	152	96	114	71
1,700	76.0	43.1	17.8	150	150	96	116	70
1,800	77.5	46.5	18.2	150	150	96	120	68
1,900	80.0	50.7	18.8	149	150	98	122	68
2,000	84.0	56.0	19.7	148	150	98	124	68
2,100	83.0	58.1	19.5

NOTE—On the mixture control sector, position 2.75 is full rich, 6.75 full lean.

Brake arm, 21 inches.

Fuel used, spec. grav., 50 per cent benzol, 50 per cent domestic aviation gasoline.

Oil used, Spec., No. 2-23B Grade 3, 115-125 sec.

Spark plugs, A. C.

Carb. used, Stromberg NA-D6 Model.

Chokes, 1-13/16 inches.

Main jets flow, 74.5 pts. per hr.

Average barometer, 29.19 in. hg.

Date, October 12, 1921.

TABLE 2.—Model H-2 Engine, A. S. No. 94895.

FULL POWER CHECK RUN AT 2,000 R. P. M.

R. p. m.	Actual.		Corrected.		Water.		Oil.			Carb. air temp. °F.	Man. vac. in. hg.	Mix. control position. ¹	Fuel cons.	
	Brake load lbs.	B. h. p.	H. p.	B.m.e.p. lbs. per sq. in.	Temp °F.		Temp. °F.		Press. lbs per sq. in.				Lbs. per hr.	Lbs. per hp. hr.
					In	Out	In	Out						
2,000	559.0	372.9	387.6	136.3	138	152	112	126	60	68	1.7	F. R.	204.6	0.549
2,012	557.0	373.8	388.5	135.8	132	148	126	140	60	68	1.7	Best	185.5	.497

Drops to 1,300 r. p. m., 400 lbs., brake load, at full lean.

FULL POWER RUN.

1,490	580.5	288.3	299.8	141.4	132	150	134	140	58	68	1.1	4.2	148.5	0.515
1,600	583.0	311.0	323.2	142.1	133	152	134	141	58	68	1.2	4.2	158.2	.509
1,680	583.0	326.8	339.6	142.1	130	148	134	141	60	68	1.3	4.2	162.1	.497
1,791	576.0	344.1	357.7	140.4	130	150	134	142	60	68	1.6	4.2	173.1	.503
1,893	564.0	356.2	370.3	137.7	132	150	136	144	60	70	1.8	4.2	184.8	.519
2,010	561.0	376.0	390.8	136.7	133	150	140	150	60	70	1.8	4.2	191.5	.510
2,090	549.0	382.6	397.7	133.8	133	150	142	154	60	70	2.1	4.2	194.0	.507

FRICTION HORSEPOWER RUN (THROTTLE WIDE OPEN).

R. p. m.	Brake load lbs.	F. h. p.	F.m.e.p. lbs. per sq. in.	Water.		Oil.			Carb. air temp. °F.
				Temp. °F.		Temp. °F.		Press. lbs. per sq. in.	
				In.	Out.	In.	Out.		
1,500	60.5	30.3	14.2	148	150	130	130	58	70
1,600	68.0	36.3	16.0	148	149	130	131	60	70
1,700	77.0	43.7	18.1	149	150	128	134	60	70
1,800	79.0	47.4	18.5	149	150	128	140	60	70
1,900	81.0	51.3	19.0	150	150	128	142	60	70
2,000	82.5	55.0	19.4	150	150	132	138	60	70
2,100	82.0	57.4	19.2	151	151	134	138	60	70

¹ NOTE—On the mixture control sector, position 2.0 is full rich, 7.5 full lean, "Best" represents leanest setting allowing maximum power output.

Chokes, 1-13/16 inches.

Main jets, flow 76 pts. per hr.

Average barometer, 28.79 in. hg.

Date, October 7, 1921.

Brake arm, 21 inches.

Kind of oil, Spec. No. 2-23B, Grade 3, 115-125 sec.

Fuel used, 50% benzol, 50% domestic aviation gas.

Spark plugs, A. C.

Carb. used, Stromberg NA-D6 model.

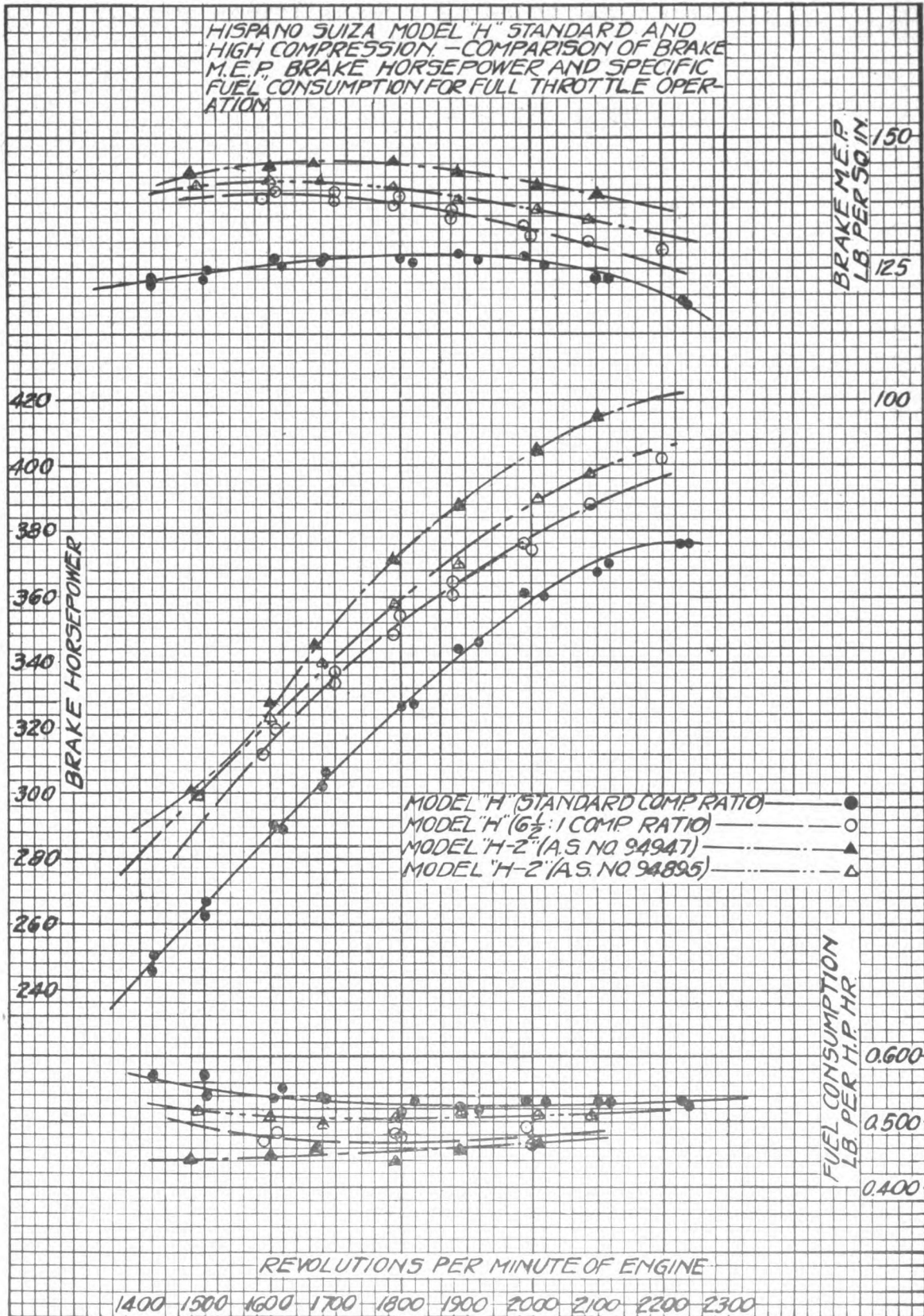


FIG. 1.

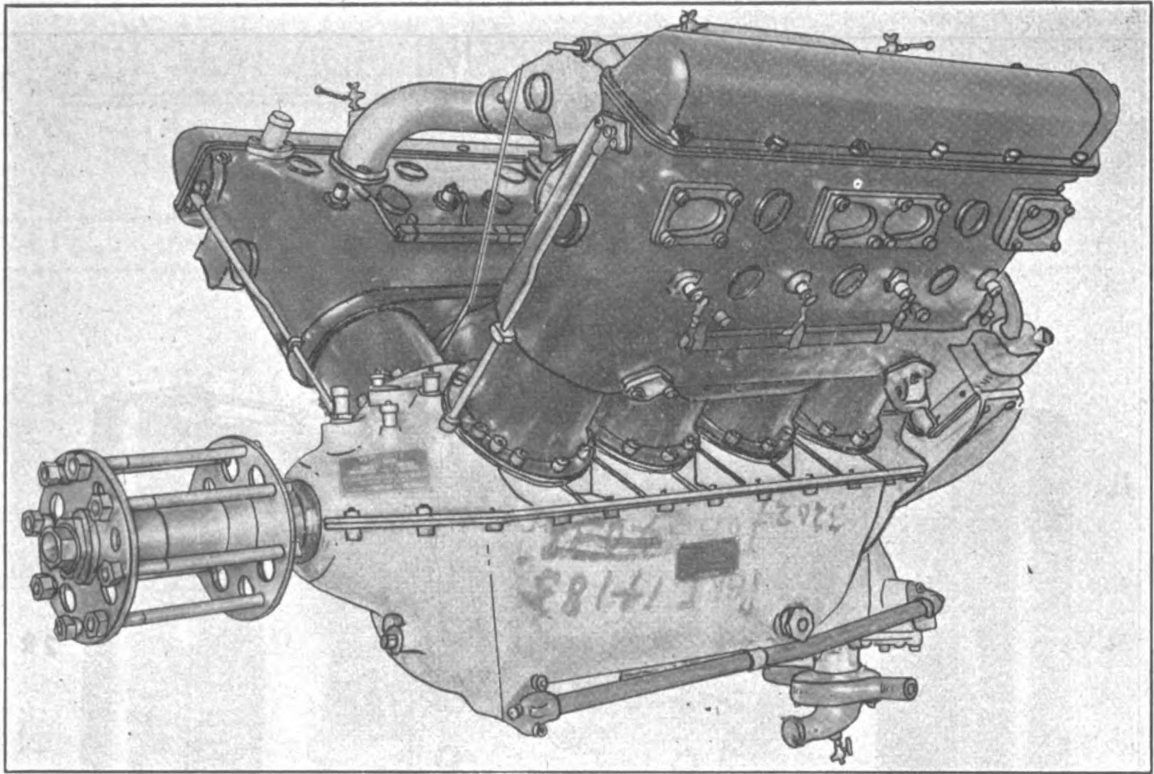


FIG. 2—Wright "Superfighter" Model H-2 Engine. Three-quarter front view.

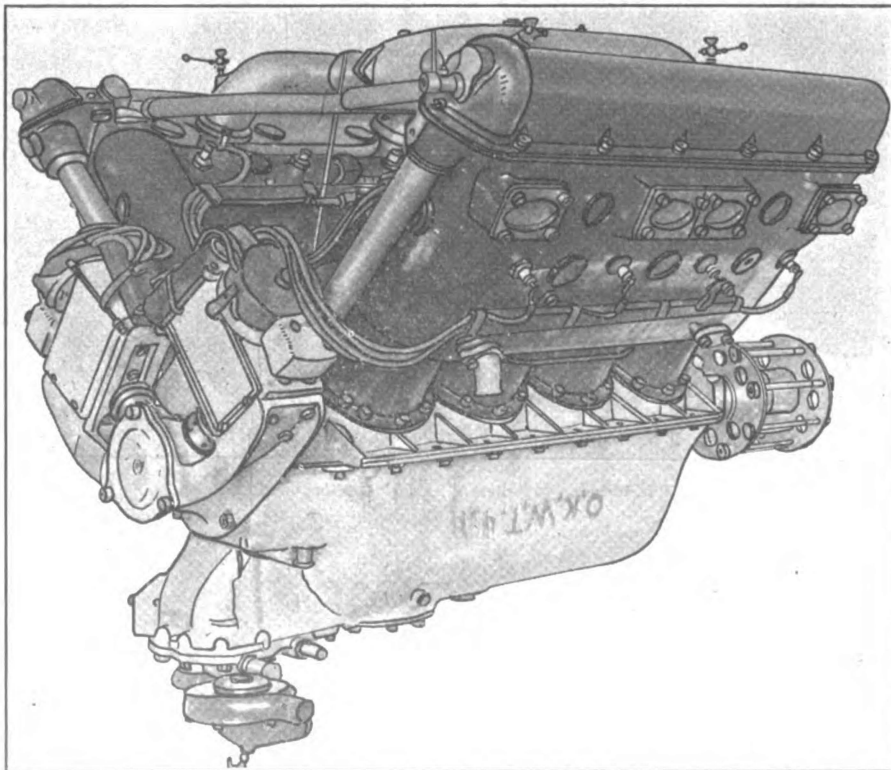


FIG. 3—Wright "Superfighter" Model H-2 Engine. Three-quarter rear view.

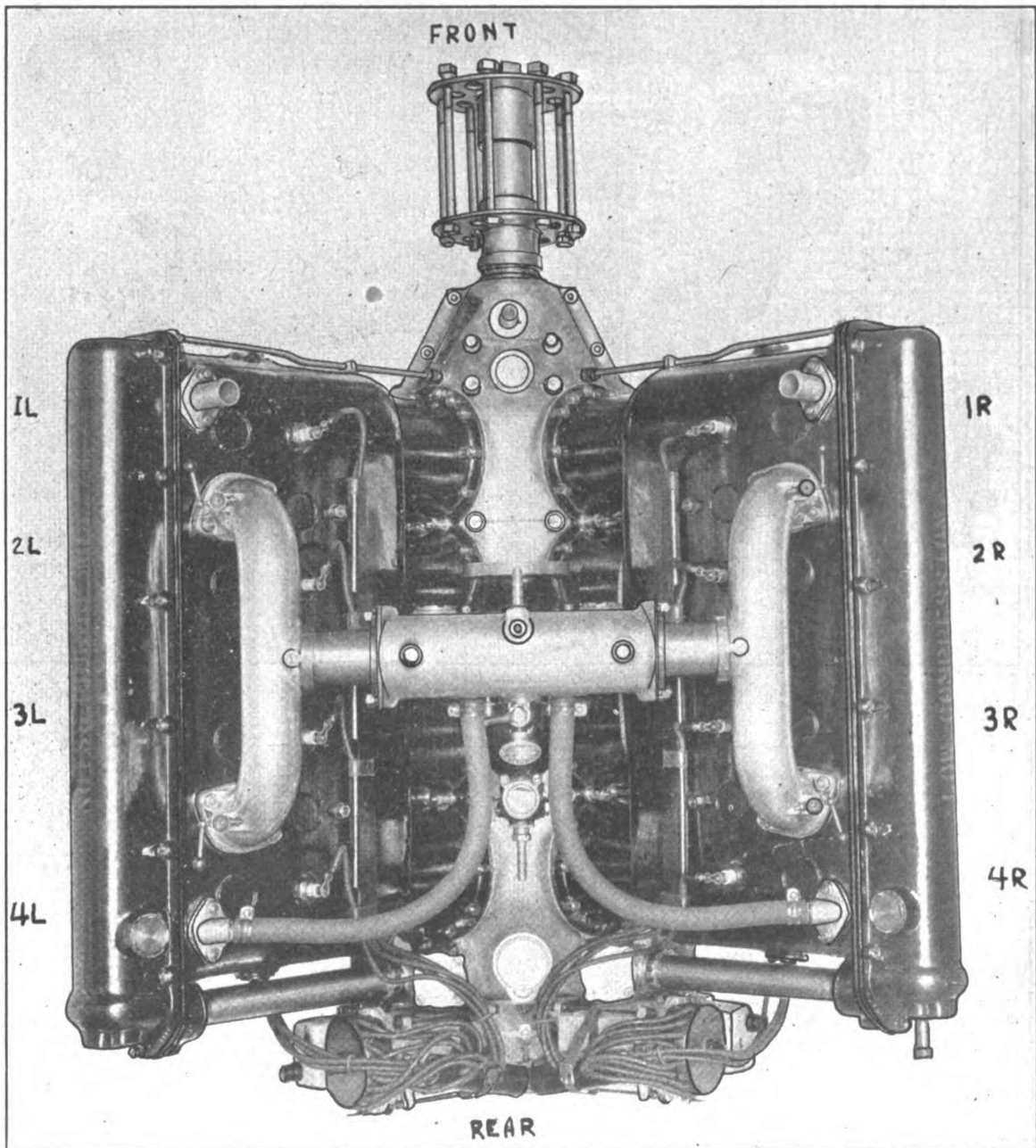


FIG. 4—Wright "Superfighter" Model H-2 Engine. Top view.

